1   **METHOD FOR ESTABLISHING VIRTUAL INTRANET OVER**

2   **INTERNET BASED ON A DIGITAL CLOSED NETWORK**

3   **CONSTRUCTED FROM A TELEPHONE EXCHANGE AND A KEY**

4   **TELEPHONE SYSTEM AND THE VIRTUAL INTRANET**

5   **STRUCTURE USING THE SAME**

6   <u>BACKGROUND OF THE INVENTION</u>

7   1. Field of the Invention

8   The invention is related to a virtual intranet based on a digital closed

9   network, and more particularly to a virtual intranet which is established by the

10   digital closed network over the Internet.

11   2. Description of the Prior Art

12   Since the VoIP (Voice over Internet Protocol) has the advantage of

13   lower communication cost compared to the conventional telephone system and

14   has the ability to integrate data, more and more enterprises employ the VoIP as

15   their communicating means. Based on the established VoIP, the enterprise can

16   simultaneously perform the voice, data and video signal transmission over the

17   single IP platform. Therefore, not only is the internet management process

18   simplified, but also the entire cost is reduced. With reference to Fig. 8, a local

19   area network (LAN) integrated with a telephone exchange system is mainly

20   composed of hubs (70), computers (71) and a telephone exchange (72), wherein

21   each hub (70) is further connected with extensions (73). As shown in Fig. 9, a

22   hub (70) is connected to a plurality of computers (71), wherein some specific

23   computers (71) are respectively connected with the telephone exchange (72) and

24   the extension (73).

1   In the intranet architecture mentioned above, the extension (73) only

2   occupies a part of bandwidth (for example, 4K) for voice signal transmission.

3   However, whether using the conventional IP network or the LAN, the data signal

4   (data packet) is the main transmission subject. The objective of the network

5   architecture design still focuses on the improvement of the reliability, i.e. to

6   make the data packet have the highest transmission priority during the

7   transmission process. In such a condition, when a great amount of data is

8   transmitted among these computers (71), the serious problems of voice signal

9   transmission delay and jitter accordingly arise. However, for voice signals, the

10   most essential requirement is immediate transmission (i.e. the real time

11   transmission). Therefore, the poor transmission quality is obvious.

12   Since the conventional intranet configuration is unable to solve the delay

13   problem of signal transmitting, one temporary way to improve the voice signal

14   transmission quality and to alleviate the problemis by utilizing the broad

15   bandwidth. However, when a great quantity of data is being transmitted, these

16   data still cause delay to the voices and such a temporary solution is unable to

17   completely overcome the problem. Besides, the intranet architecture mentioned

18   above is composed of the computers, the hub, the extensions to transmit data and

19   voice signals so the extensions are limited in this intranet architecture to

20   communicate with each other. That is, no one extension can communicate with

21   others in the same Internet configuration.

22   To overcome the shortcomings, a virtual intranet based on the digital

23   closed network in accordance with the present invention obviates or mitigates

24   the foregoing mentioned problems.

1 ## SUMMARY OF THE INVENTION

2   The primary objective of the present invention is to provide a virtual

3 intranet based on the digital closed network, which is constructed by a network

4 PBX and a key telephone system (KTS) to allow extensions that transmit the

5 voice, data and video signals over the Internet or other LAN, MAN etc IP

6 networks back to the other extensions, and still retain the superior voice

7 transmission quality.

8   To achieve the objective, the virtual intranet is constructed of the

9 network PBX, multiple extensions connected to the network PBX, wherein the

10 network PBX and each telephone respectively have connection to an IP network

11 capability to transmit IP packages over the IP network.

12   Each extension has a unique number, which is stored in the network

13 PBX. The network PBX stores extension numbers, virtual IP addresses and at

14 least one published IP address, and is set up with an identification method for

15 automatically setting up extension numbers, virtual IP addresses and the

16 published IP address to every extension connected to the network PBX.

17 Therefore, when the registered extension is brought to another place the

18 registered extension can be connected to a modem or an XDSL to link to the

19 Internet. The registered extension stores the published IP address of the network

20 PBX so the registered extension uses the published IP address to link back to the

21 network PBX through the Internet. Therefore, the distant registered extension

22 and the network PBX are constructed via the virtual Intranet.

23   Other objectives, advantages and novel features of the invention will

24 become more apparent from the following detailed description when taken in

1 conjunction with the accompanying drawings.

2 BRIEF DESCRIPTION OF THE DRAWINGS

3 Fig.1 is a function block diagram of a first embodiment of a virtual

4 intranet having a digital closed network configuration over the Internet in

5 accordance with the present invention;

6 Figs. 2A-2C are schematic topologies showing a network PBX (private

7 branch exchange) connected to a plurality of extensions in accordance with the

8 present invention;

9 Fig. 3 is a block diagram of the digital closed network configuration of

10 the first embodiment in accordance with the present invention;

11 Fig. 4 is a function block diagram of a second embodiment of a virtual

12 intranet having a digital closed network configuration over the Internet in

13 accordance with the present invention;

14 Fig. 5 is a block diagram of the digital closed network of the second

15 embodiment in accordance with the present invention;

16 Fig. 6 is a connection schematic view showing a small virtual intranet

17 having one network PBX;

18 Fig. 7 is a connection schematic view showing a large virtual intranet

19 having multiple network PBX connected with each others;

20 Fig. 8 is a function block diagram of a conventional network

21 configuration; and

22 Fig. 9 is a further function block diagram of a conventional network

23 configuration.

24 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

1   With reference to Fig. 1, a closed network in accordance with the present

2   invention comprises at least one network telephone exchange (private branch

3   exchange, PBX)(10), and a key telephone system (KTS) composed of a plurality

4   of extensions (20).

5   The network PBX (10) includes a main controller (11) and a packet

6   switch (12). The packet switch (12) has at least two network ports (121, 122) for

7   the IEEE 802.3 protocol to connect the extensions (20). The main controller (11)

8   connected to the packet switch (12) stores multiple extension numbers for the

9   extensions (20) and is set up with an identification method. The main controller

10   (11) further stores multiple virtual IP addresses corresponding to each extension

11   number. The network PBX (10) further comprises a packet processing unit (13)

12   for two-way converting connected between the main controller (10) and an extra

13   PBX (30) for PSTN (31). The packet switch (11) is set up with at least one

14   published IP address for linking to the Internet through one network port (121)

15   connected to a network device (not numbered) as a modem or an XDSL (not

16   numbered).

17   The plurality of extensions (20) is able to connect to the network port

18   (122) of the network PBX (10) with different topologies (as shown in Figs. 2A-

19   2C) so as to construct a closed network for voice, data and video transmitting.

20   The extensions (20) are able to communicate with each other through the

21   network PBX (20).

22   With reference to Fig. 3, each extension (20) further includes:

23   a controller (21) with a two-way converting function, wherein the

24   controller (21) is able to convert voice signals to the form of voice packets, and is

1   able to restore the voice packets to the voice signals, wherein the controller (21)

2   stores an own extension number and the own virtual IP address from the main

3   controller (shown in Fig. 1) and the published IP address;

4   a handset (22) to receive voice signals from a user and then transmit to

5   the controller (21), or to broadcast voice signals output from the controller (21);

6   a first network connecting interface (23) connecting between the

7   controller (21) and the network device (30), wherein the first network

8   connecting interface (23) follows the IEEE 802.3 protocol so the network   .

9   connecting interface (23) is for connection with a network interface card for

10   IEEE 802.3 protocol installed in an extra network device (30);

11   a second network connecting interface (24) connecting between the

12   controller (21) and the network port (shown in Fig. 1) of the network PBX(10);

13   a key set (25) connected to the input terminals (not numbered) of the

14   controller (21) for the use of dialing or parameters setting;

15   a display (26) connected to the output terminal of the controller (21) to

16   display messages or video images; and

17   an image capture device (27), such as a CCD (Charge-Coupled Device)

18   camera, connected to the input terminal of the controller (21) for the use of

19   image capture, wherein the captured images are then processed to become the

20   form of video packets by the controller (21) for further transmission.

21   ·   Each extension (20) further includes a bridge (28) linked between the

22   first network connecting interface (23) and the second network connecting

23   interface (24) to perform the transmission flow control of the closed network.

24   From the foregoing description of the network architecture, the plurality

1   of extensions (20) not only constructs the closed network in company with one

2   network PBX (10), but each extension (20) is also used as an intermediary node

3   that allows the personal computer, hub, network printer etc. to communicate

4   with the closed network.

5   When the closed network is constructed, each extension (20) stores its

6   own extension number, virtual IP address and the published IP address.

7   Therefore, an establishing virtual intranet method includes the steps of :

8   (a) registering each extension to the telephone exchange so that each

9   extension has an own extension number and the published IP address;

10   (b) connecting at least one distant registered extension to an extra

11   network device such as a modem or XDSL;

12   (c) linking at least one registered extension back to Internet by the

13   network device;

14   (d) using the published IP address as a destination IP address in IEEE

15   802.3 package; and

16   (e) linking at least one registered extension back to the network PBX.

17   With further reference to Fig. 1, when the distant registered extension

18   (20) links to the network PBX (10) over the Internet (not numbered), the virtual

19   intranet is constructed, wherein the virtual intranet includes the Internet. In such

20   a virtual intranet, the distant registered extension (20') can dial a specific

21   extension number of one extension (20) connected to the network PBX (10) to

22   establish a point to point connection over the Internet. Thus, a company

23   salesperson can bring one of the registered extensions (20') to anywhere. The

24   salesperson only has to connect the registered extension (20') as a distant

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1   registered extension to the Internet and then can make a call back to the company

2   for talking or transmitting digital data.

3   With reference to Fig. 4, a second embodiment of the present invention

4   is similar to the first embodiment. The main controller (11) of the network PBX

5   (10a) is further connected to a wireless port (14) for the IEEE 802.11x protocol.

6   Therefore, the network PBX (10a) is further connected to an extra wireless

7   Access point (AP). With reference to Fig. 5, multiple wireless extensions (20a,

8   20b) are used in place of some of the extensions (20) in the first embodiment.

9   One kind of wireless extension (20a) is similar to the extension (20) in the first

10   embodiment and only further has a wireless network port (29) for a wireless card

11   (40). The wireless network port (29) and the wireless card (40) are used in place

12   of the second network connecting interface (24). Another wireless extension

13   (20b) is similar to the extension (20) and only further includes a wireless

14   network port (29) and a wireless card (40) so the wireless extension can link to

15   the network PBX (10a) through the second network connecting interface (24) or

16   the wireless card (40). The wireless extension (20a, 20b) links to the network

17   PBX (10) by the wireless card (40) and the wireless AP (15).

18   With reference to Fig. 6, the network PBX (10) has all extension

19   numbers so any one extension (A) required to connect to one or more extensions

20   (20) can do so by sending a requirement package including the extension number

21   of the specific extension (B) to network PBX (10). When the network PBX (10)

22   receives the requirement package (denoted by a broken line between the network

23   PBX (10) and the extension (A)), the main controller (11) will execute the

24   identification method to check whether the specific extension (B) is online

1   (denoted by a broken line between the network PBX (10) and the extension (B)).

2   If the specific extension (B) is online the main controller (11) is able to notify the

3   specific extension (B) of the virtual IP address of the extension (A) that sent the

4   requirement package. The specific extension (B) can connect to the extension to

5   establish a connection by the virtual IP address of the extension (A) (denoted by

6   a curved line between the extension (A) and the specific extension (B)). The

7   network PBX (10) is also able to send back the virtual IP address of the specific

8   extension (B) to the extension (A) after the network PBX (10) ensures the

9   specific extension online (B). Therefore, the extension (A) can connect directly

10   to the specific extension (B) by the virtual IP address of the specific extension

11   (B).

12   With further reference to Fig. 7, to enlarge a range of the virtual intranet,

13   at least two network PBXs (10) are connected to a common main bridge (50)

14   based on the fiber optical network for IEEE 802.3 protocol or Ethernet backbone.

15   That is, each main controller (11) further comprises a network backbone port (16)

16   and the bridge (50) has at least two different network ports (51) (52) for Ethernet

17   or IEEE 802.3 protocol. The network backbone port (16) is connected to the

18   corresponding network port (51) of the bridge (50) through the Ethernet

19   backbone or IEEE 802.3 backbone. Therefore, the bridge (50) is a central

20   network switch to exchange packages in different network PBXs (10).

21   One special point that needs to be noted is when the voice signal is

22   communicating over the closed network, the network will provide superior

23   transmission quality. For example, if one extension (20) is used as a transmitter

24   (the voice source), the input voice from the handset (22) is converted to the form

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1   of voice packets by the controller (21) and then transmitted over the closed

2   network. After another extension (20), which acts as a voice receiver, receives

3   and converts the voice packet to a voice signal by the controller (21), the voice

4   signal is then broadcasted via the handset (22). Since the voice is transmitted in

5   the form of voice packets, the problems of transmission delay and jitter are

6   accordingly overcome. Moreover, by controlling the controller (21) and the

7   bridge (28) to properly set the transmission priority among the voice packets,

8   data packets and the video packets, the transmission quality is able to be further

9   improved. In other words, because of the controllable transmission flow in the

10   closed network, the real time voice transmission is assured.

11   In conclusion, the present invention providing a virtual intranet differs

12   from the conventional the intranet limited in a specific place and together with

13   the telephone system having packet conversion ability and bridge function

14   collectively provides an immediate voice transmission, wherein the problems of

15   delay and jitter are avoided. In addition, the network architecture of the present

16   invention also meets the data transmission protocol (IEEE 802.3/302.11x) to

17   ensure that the data/video packets are correctly transmitted among all nodes of

18   the network. In other words, the present invention still retains the high reliability

19   for data/video transmission.

20   The invention may be varied in many ways by a skilled person in the art.

21   Such variations are not to be regarded as a departure from the spirit and scope of

22   the invention, and all such modifications are intended to be included within the

23   scope of the following claims.